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Intracellular trafficking of lipoplexes: A particle image correlation spectroscopy (PICS) study

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Particle image correlation spectroscopy (PICS) is a powerful and robust analysis technique to investigate the dynamics of molecules with nanometer and millisecond spatio-temporal resolution [1]. This tool allows one to identify and categorize populations within an ensemble of particles, without any a priori knowledge about the dynamics. PICS is here applied to investigate the intracellular trafficking of lipoplexes in CHO living cells. We measured diffusion coefficients and velocities for DOTAP–DOPC/DNA (DOTAP: 1,2-dioleoyl-3-trimethylammonium-propane; DOPC: dioleoylphosphocholine) and DC-Chol–DOPE/DNA (DC-Chol: 3β-[N-(N,N-dimethylaminoethane)-carbamoyl] cholesterol; DOPE: dioleoylphosphatidylethanolamine) lipoplexes. The results corroborate findings from previous experiments using single particle tracking and spatio-temporal image correlation spectroscopy [2, 3]. PICS allowed us to construct the displacement distributions that displayed clear non-homogeneous behavior. Detailed analyses showed for the first time a strong evidence of lipoplex transitions between active transport (mostly along microtubules) and free Brownian motion in the cytosol. For this latter finding a full theoretical description of intermittent diffusion was developed.

References

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